MARYLAND
DEPARTMENT OF
NATURAL RESOURCES

Robert L. Ehrlich, Jr., *Governor*
Michael S. Steele, *Lt. Governor*
C. Ronald Franks, *Secretary*

Maryland Licensed Tree Expert Exam Study Guide

For Exam Domain:

Diagnosis

Version 2.0

Date: 12/05

Trees often decline or experience problems due to multiple factors. Problem diagnosis is more complex than simply looking for the first insect or disease you can find and then declaring that the problem has been identified. If a person has a cough, they may have a cold or they may have cancer. A diagnosing physician would want to ask the patient about the problem they are experiencing, examine the patient's medical history (previous history of disease; smoker/non-smoker, etc.), examine the patient's family's medical history (family history of heart disease, cancer, etc.), and perform certain standard diagnostic tests (blood pressure, temperature, etc.). A tree diagnostician would follow a similar pattern of research, observation and testing to diagnose and recommend treatment for a tree.

Proper steps in diagnosis of tree problems include:

- Tree identification. What type of tree are you diagnosing? The "family history" of the tree is very important, as certain pests are specific to certain species, genera, or families of plants.
- Looking for something out of the ordinary. The Body Language of Trees tells us that trees grow and develop in a logical way, and if something looks unusual it means something may be wrong. Learning how to read these signs can help you understand what the tree is "telling" you about its condition. Trunk lean, decay fungi, root plate heaving, bulges on trunks, and spots on leaves all indicate potential problems. Trees will tell you what the problem is if you look carefully and thoroughly at the entire tree: roots, stem, and crown.
- Examination of the site around the tree. Trenching, ground disturbance, herbicide application, storm damage, and other factors that could affect tree health may be revealed by examining the site surrounding the tree.
- Examination of any available site maintenance history. The "medical history" of a tree, if available, should provide background on attending arborists and treatments performed. You may be able to contact prior practitioners to confer on what was done and why, or find a pattern of previous problems based on prior treatments performed.
- Performing certain diagnostic tests, if appropriate. A soil test can provide information on nutrient deficiencies or pH problems. Invasive but useful tools for evaluating tree growth include the increment borers and various types of decay detection equipment. These tools can allow the arborist to examine changes in tree ring growth over time.

Non-invasive tools for evaluating the extent of internal decay include tools using radar technologies or sound waves. These tools can detect the quantity and quality of remaining wood without disturbing the wood of the tree. Root collar excavations, whether performed solely be hand or with mechanical assistance, can reveal stem girdling roots, whether a tree was planted too deeply, or whether the burlap and twine or wire basket was removed at planting.

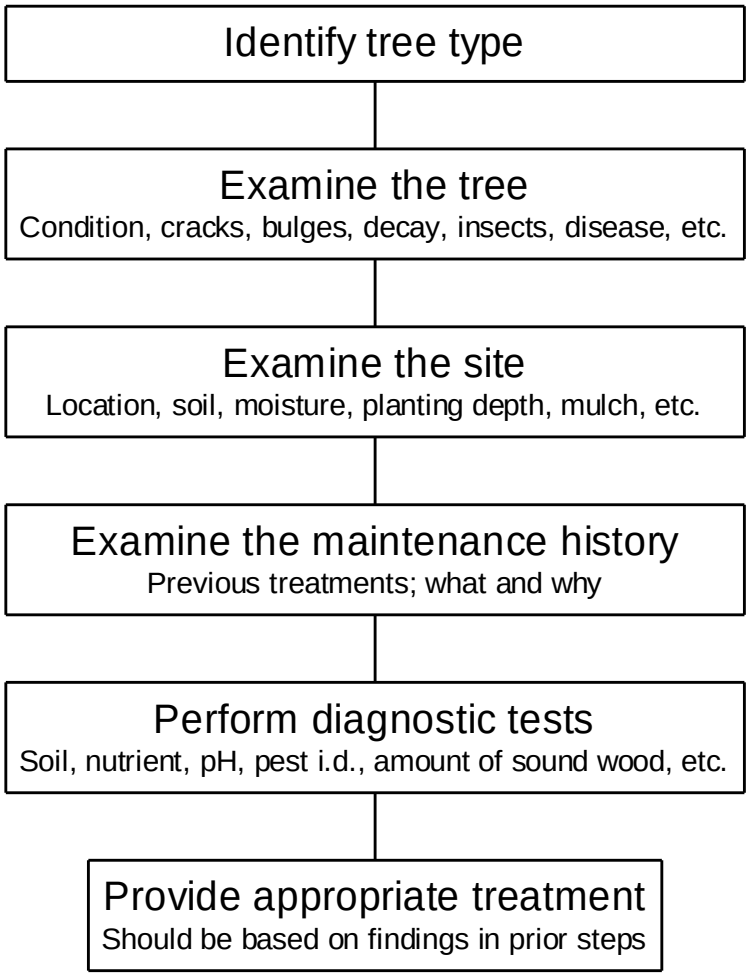

Figure 1 - Problem diagnosis flow chart

Injuries caused by ice, lightning, or pesticides are examples of impacts from abiotic (non-living) factors. In urban areas, most tree failure occurs as a result of storms. If a vertical strip of bark is missing from a point in the crown down to the ground, with a rough groove that follows the grain of the wood, a likely cause is a lightning strike. Other abiotic disorders include damage from temperature extremes, pollution damage, and chemical injury (normally from herbicide misapplication).

Diseases caused by bacteria, nematodes, or fungi are examples of impacts from biotic (living) factors. Holes in the bark that are in uniform horizontal bands around the trunk are likely caused by sapsuckers. Insects with chewing mouthparts include borers, caterpillars, and leaf miners and do not include mites.

Sign or symptom	Possible cause
Sooty mold	Infestation by aphids or scale
White to gray-white fungus on leaf and shoot surfaces	Powdery mildew
Canker (localized dead tissue) on stem or branch	Wounding or disease
Dark, discolored streaks in the young xylem	Verticillium wilt
Root galls	Insects, nematodes, or nitrogen-fixing bacteria
Mushrooms or conks	Decay fungi
Lack of trunk flare on a portion of the trunk at the soil line	Stem girdling root
Small emergence holes in the trunk or branches with frass (looks like sawdust)	Wood-boring insect
Holes in leaves	Insects or diseases
General yellowing of leaves (chlorosis)	Sucking insects, pH problems nutrient deficiency)
Wilting of leaves	Lack of water, vascular system disease

In some cases the most obvious pest is not the primary culprit. Sucking insects, though easy to detect, are not normally primary causes of tree death. Some apparent diagnostic clues do not indicate anything. For example, exfoliation (peeling) of the bark on a mature plane tree (*Platanus x acerifolia*) is normal. However, peeling bark on type of tree that does not have exfoliating bark under normal conditions would be a cue for further assessment.

Some plant pests travel on their own. Some are carried by vectors (carriers). Elm yellows and Dutch elm disease are both examples of diseases that are often transmitted by insect vectors. Bacterial Lead Scorch is thought to be transmitted by insect vectors. Some pests are transported primarily by people. Emerald Ash Borer was introduced in Maryland on infested nursery stock. The Asian longhorned beetle has not yet been detected in Maryland.

When collecting samples for the purpose of diagnosing plant problems, it is important to collect samples that include the transition from diseased or affected tissue to healthy tissue so that the diagnostician can compare the healthy and infected portions of the plant.

Arborists often are requested to perform risk tree assessments. The need for risk tree assessment is normally based on the premise that personal injury or property damage could result if a certain tree failed. Because liability is possible, such assessments should be documented in writing. People, structures, improvements, and vehicles are potential targets for hazardous trees. Unimproved inaccessible areas are not potential targets for hazardous trees. An unsound tree in an area with no target is not a hazard. If a previously unimproved area becomes developed, there may be a corresponding change in the need for tree assessment. Sometimes the risk of failure may be due to the type of tree - fast-growing trees are usually weak-wooded and failure prone. The arborist will normally read the tree's "body language" for things out of the ordinary, including:

- Longitudinal cracks or splits in the trunk or branches
- Branches or stems that lack taper
- Codominant stems or branches

- An external swelling or bulge (a likely indicator of internal decay or a cavity)
- An external rib on a tree (a likely indicator of an internal crack).
- Cracks or lifting of the soil on the opposite side of the lean on a leaning tree likely indicate movement of the root system, soil failure, and/or pending tree failure.

Decay which only affects the dead tissue in the center of the tree trunk is normally referred to as heartrot. Most experts agree that 30 – 35 percent loss of stem diameter due to heartrot requires that some action be taken to address the risk of failure. Mushrooms or conks on a trunk or branch indicate a need for further assessment to determine whether or not internal decay is present. Brown rots are fungi that consume cellulose, resulting in wood that is stiff but brittle like a hard biscuit and subject to failure without warning.